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AUTHOR Paese, Paul C.
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ABSTRACT

The amount of time students are engaged in the subject matter in physical education has been found to have a high correlation with student achievement. Academic Learning Time-Physical Education Motor [ALT-PS(M)] is defined as the amount of time a student spends in physical education content doing a motor skill with a low error rate. A report is given of a study that: (1) examined the effect of increasing teacher verbal feedback to students on ALT-PE(M) and engaged time in the classes of three experienced elementary physical education teachers; (2) examined the effect of increasing teacher verbal feedback to students and providing information to the teacher concerning percentages of students waiting in class on ALT-PE(M) and engaged time; and (3) determined whether changes in ALT-PE(M) and engaged time were maintained after interventions were removed, if in fact changes did occur. Primary physical education classes with twenty-five to thirty students were observed. A description is presented of the method of data collection, the research design, and coding categories (setting, content, learner move, and difficulty level). An analysis of results indicates that a behavior change took place in all three teachers and their classes as a result of the interventions applied. This was demonstrated when comparing the mean averages of engaged time ALT-PE(M) and teacher feedback during each intervention phase. Recommendations are made for further research. (JD)

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Increasing Academic Learning Time In Elementary Physical Education

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Paul C. Paese
Southwest Texas State University
Health, Physical Education, and Recreation Department
San Marcos, Texas 78666-4616

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It is very evident when perousing the professional literature in pedagogy over the past six years that great strides have been made. One important finding in teacher effectiveness research in physical education is Academic Learning Time-Physical Education (ALT-PE) ALT is a powerful way to make judgments about teacher practices and is a strong proxy for student achievement (Siedentop, Tousignant, and Parker 1982). ALT-PE is a refinement of the traditional time on task variable that arose out of the Beginning Teacher Evaluation Study (Berliner 1979). The importance of ALT-PE as a major variable in physical education teacher effectiveness is demonstrated in the literature (Dodds and Rife 1983). The amount of time students are engaged in the subject matter in physical education has been found to have a high correlation with student achievement (Paese 1984). The most important category to come out of ALT-PE has been Academic Learing Time-Physical Education Motor. ALT-PE(M) is defined as the amount of time a student spends in physical education content doing a motor skill with a low error rate (Metzler 1979). ALT-PE has been used almost exclusively as a process variable in descriptive research studies and in process-product studies in physical education.

Over the past ten years problems in collecting data for teacher effectiveness research has decreased. The reason for this is a proliferation of observation systems that have developed in physical education since the early 1970's. It is just a matter of understanding the focus of the research and then choosing the best system to collect the information. The focus of many teacher effectiveness studies in physical education has been on teacher behaviors, patterns of teaching, relationships between class behaviors and student achievement, task structure, etc. Some of the observational systems developed have focused in on teacher-student interaction. Cheffers' Adaption of the Flanders Interaction Analysis System (CAFIAS, Cheffers 1972) is not only the

most popular interaction system used in physical education, but was the first observation system developed in physical education. There are several observational techniques that are very simple to use, i.e., event recording, duration recording, placheck recording, etc. and when combined can generate a lot of data on teaching (Siedentop 1983). A text by Darst, Mancini, and Zakrajsek (1983) detail all of the major systems mentioned in this manuscript and in physical education.

The most popular systems being used at the present time for teacher effectiveness research and to analyze teaching are Academic Learning Time Observation System (Siedentop, Birdwell and Metzler 1979) and Academic Learning Time Observation System II (Siedentop, Tousignant and Parker 1982). These systems allow an investigation into how students spend time in physical education class as a result of what teachers do. The most important aspect of the aforementioned statement, as mentioned earlier in the text, is the relationship of student involvement in the subject matter and the opportunity to practice skills with student achievement. In a nutshell that is what ALT-PE is and this knowledge base has developed only through the use of observational techniques. There is a need to do more experimental studies attempting to increase ALT-PE(M) with experienced teachers, since most of the research using this variable has been with student interns in professional preparation programs. The purposes of this study were as follows:

1. to examine the effect of increasing teacher verbal feedback to students on ALT-PE(M) and engaged time in the classes of experienced elementary physical education teachers.
2. to examine the effect of increasing teacher verbal feedback to students and providing information to the teacher concerning percentages of students waiting in class on ALT-PE(M) and engaged time.

3. to determine whether changes in ALT-PE(M) and engaged time were maintained after interventions were removed, if in fact changes did occur.

Methods and Procedures

Subjects and Settings

The subjects used in the study were three experienced physical education teachers in the central Texas area. All three teachers had between four and fifteen years of teaching experience and were all female. The classes observed were in primary physical education and had class sizes of twenty-five to thirty. Since the classes were videotaped it was possible to observe two sets of three students each time. These same six students in each of the three teachers' classes were observed during each observation. Students chosen for observation were pre selected with help from the teachers. Out of each set of six students two were high skilled students, two were average in skill and two were below average in skill.

Data Collection

Observation of target students in each teachers' class were made by two observers trained to use the ALT-PE Observation System. Each class videotaped lasted approximately twenty-five minutes. All three teachers and their respective classes were observed twenty times over a seven week period (approximately three times a week) with two post checks following intervention. The first post check was taken one week after intervention and the second post check three weeks later. More post checks would have been taken but the school year was only one week from completion following the last post check. Observers coded the videotapes in the video lab at the university before the next observation.

Research Design

A multiple baseline (Hall 1971) across three subjects was used as the experimental design for this study. Multiple baselines have gained in popularity since their inception into educational based studies. In the study completed targeted students from each teachers' class were measured at the same time during baseline before any intervention strategy was employed. Following baseline, the first intervention strategy was implemented on only the first teacher in the study. During this first intervention on the first teacher, baseline measurement continued on the other two teachers' classes. After a change was generated or when no change was taking place a second intervention was made on the first teacher. At this time the first intervention was implemented on the second teacher while baseline measurement continues on the third teacher. The study concluded when all three teachers had been intervenned on with the two independent variables.

Descriptions of Coding Categories

The four major coding categories used in the Academic Learning Time Observation System (Siedentop, Birdwell and Metzler 1979) are setting, content, learner move and difficulty level and are described as follows:

1. Setting - the setting category represents the spectrum of teaching styles command, task, reciprocal, group, guided discovery and problem solving. (See Mosston 1966).
2. Content - the content category is divided into two major groups: content general and content p.e. Content general includes categories in a non academic focus such as wait, transition, management and break. Content p.e. has a physical education focus such as skill practice,

scrimmage, game, fitness, knowledge or social behavior.

3. Learner Move - in this category a learner is either engaged or not engaged. A student can be engaged indirectly (spotting), cognitively (listening to the teacher go over rules, techniques, etc.) and in a motor skill. A student is not engaged if he/she is off task, waiting, (in line waiting to do a motor skill, substitute in a game, etc.) or interim (changing sides of the court).
4. Difficulty Level - learner involvement in the subject matter, hard, medium or easy, i.e., student in skill practice having no difficulty bumping the volleyball (easy).

Another category added to the original four categories is the teacher behavior category. During this interval the teacher is coded and can be involved in a number of behaviors such as lecturing, giving directions, asking questions, answering questions, monitoring, officiating, modeling, participating, spotting, nagging and giving feedback. Feedback was the major teacher behavior coded. Feedback consists of verbal comments made to students on behavior and skill performance.

It must be noted that the major focus of the first two coding categories (setting and content) is the total class. The major focus of the next two coding categories (learner move and difficulty) is the individual targeted student.

Reliability

Each observer went through an extensive twenty-hour training period before data collection began. Both observers had to achieve an 80% reliability percentage or above before the study began. Observational reliability is defined as the degree in which two independent observers agree on what was

observed (Siedentop 1983).

Two reliability checks both unannounced were made on each observer during baseline and intervention phases in the lab. The Scored Interval Method (SI) (Hawkins and Dotson 1975) was used to compute interobserver agreement. Reliability was computed for four ALT-PE categories (setting, content, learner move, and difficulty level) as well as for teacher behavior, feedback and for the total number of observation intervals recorded. Table 1 indicates that reliability was acceptable for data collection using the ALT-PE interval recording system. In all cases total reliability percentage was above .80.

Table 1 goes about here

Midway through data collection both observers were given an extra training session and another reliability check was taken by assessing a precoded videotape.

Target Behaviors and Baseline Phase

The major dependent variable used in this study was the percent of ALT-PE(M) in one class with each of the three experienced teachers. "Since physical education is mainly involved in physical activity and the learning of psychomotor skills, ALT-PE(M) is a preferred measure of student opportunity to learn a skill rather than general ALT-PE (Metzler 1979). Another dependent variable monitored in the study was the percentage of engaged time in each of the teachers' classes. Engaged time is defined as the amount of time students are engaged in physical education content, doing a motor skill, listening to instruction on rules, technique, strategy or are indirectly involved in an activity such as spotting, feedings balls to a partner, etc. (Siedentop, Birdwell, and Metzler 1979). During baseline phase three categories of the ALT

Observation System (PE content, engaged time and ALT-PE(M) were recorded and calculated along with teacher behavior and teacher feedback. Of course during the baseline phase no interventions were used. The percentages in the three major categories (PE content, engaged time, and ALT-PE(M)) even though collected on target students were grouped together by class and presented as a mean percentage of intervals for each of the three teachers' classes in the study, along with teacher feedback. These percentages are illustrated in Table 2.

Table 2 goes about here

During baseline a mean of 45% of all intervals in teacher number one's class, 42.5% in teacher number two's class, and 43% of teacher number three's class were coded as engaged time. Teacher number one had a mean percentage of 14.5% ALT-PE(M) during baseline in comparison to teacher two's 18% and 13% for teacher three. Teacher three had the lowest percent of verbal feedback during baseline 13% in comparison to the 14% and 18% for teacher one and two. Non-engaged waiting was the most frequently recorded category in the learner move section and giving directions was the most frequently recorded teacher behavior.

Intervention Phases

As demonstrated in baseline, there were low percentages for both engaged time and especially ALT-PE(M) in all three teachers' classes. Since teacher number one had a baseline going opposite the desired direction for engaged time and ALT-PE(M) he/she received the first intervention. The first independent variable and intervention was the percentage of verbal feedback given by the teacher to the students. Before the next day's class the teacher was given the

total percentage of time spent giving verbal feedback to students. Prior to the beginning of this intervention teachers had to be briefed on what feedback was and the different types.

The second independent variable and intervention used was the combination of the percentage of verbal feedback and the percentage of non-engaged student waiting, which was given to the teacher prior to the next day's class. When attempting to change an experienced teacher's behavior two policies should be followed, reward cost and least intervention. Reward cost involves items a teacher can try without them being threatening. Least intervention refers to attempting to change behavior with as little as possible. Table 3 offers percentages of the three major coding categories plus feedback during both intervention phases on the three teachers and their classes.

Table 3 goes about here

Results

The percentage of ALT-PE(M) and engaged time increased in all three teachers' classes over baseline after combining the mean average increase of the two interventions. Teacher one's classes had an increase of 19% in engaged time over baseline, and a 20% increase of ALT-PE(M) over baseline. Teacher two had an increase of 17% over baseline for engaged time and almost an 18% increase over baseline for ALT-PE(M). Teacher three had an increase of 29% for engaged time and 22% of ALT-PE(M) when compared to baseline. The greatest increase in engaged time and ALT-PE(M) was during the first interventions of giving the teachers' percentages of their verbal feedback to students. The increase over baseline on an average for all teachers combined was almost 30% for engaged time and almost 16% for ALT-PE(M). During the second intervention (giving the

teacher percentages of verbal feedback to students and student waiting during activity) engaged time still increased over the first intervention by 7% and a little over 8% for ALT-PE(M). The average increase for the combined interventions over baseline was almost 23% higher for engaged time and 21% for ALT-PE(M), a 53% and 125% respectively over baseline. Table 4 illustrates the percentages of engaged time and ALT-PE(M) for all three subjects during both intervention phases, and for the combined interventions.

Table 4 goes about here

All three subjects' classes had an average of 12.9 minutes of engaged time and 4.8 minutes of ALT-PE(M) during baseline. The average increase for all three subjects was almost 7 minutes per engaged time and over 6 minutes for ALT-PE(M) after combining both intervention phases. Table 5 represents the changes in time spent in engaged time and ALT-PE(M) from baseline, for all three subjects' classes.

Table 5 goes about here

Post Checks

Two post checks were taken on all three subjects and their classes. The first post check was taken one week following the completion of the second intervention and the second post check was taken a little over two weeks after the first post check. Mean rates for all three subjects' classes on engaged time and ALT-PE(M) are presented in Table 5. Percentage for engaged time and ALT-PE(M) was significantly higher when compared to baseline.

Trends

Figure 1 graphically illustrates the daily percentages of ALT-PE(M) and engaged time in all three teachers' classes during baseline, both intervention phases, and during post checks. Figure 1 also illustrates the trends of the data for the major independent variable ALT-PE(M) during baseline and both intervention phases of the study for all three subjects' classes. All three subjects' classes had decending trends during baseline and ascending trends during the first intervention. Teacher one and two's classes had a slight decending trend during the second intervention, with a steeper decending trend for teacher three's classes.

Figure 1 goes about here

Discussion

The results seem to indicate that a behavior change took place in all three teachers and their classes as a result of the interventions applied. This is demonstrated when comparing the mean averages of engaged time, ALT-PE(M) and teacher feedback during each intervention phase with baseline averages.

The data is suspect because of the overlapping data points, instability during baselines, and because of the lack of data points in certain phases of the study. A further analysis of the data was done using the line of best fit analysis (Parsonson and Baer 1978) which illustrates trends of the data during each phase of the study for each subjects' classes. This analysis is a much more stringent measure in analyzing graphic data than just visual analysis. A major conclusion that was drawn from this analysis was that all three baseline of ALT-PE(M) had decending trends and all of three subjects' classes had ascending trends during ALT-PE(M) during the first intervention. It is also

important to note that all three subjects had slight to moderate decending trends of ALT-PE(M) during the second intervention. Because of the line of best fit analysis only a partial claim of internal validity and causality can be made for single subject design research. Of course no statistical significance can be claimed as well.

The post checks taken demonstrate that all three subjects and classes had maintained their change to approximately a 75% level, when comparing the mean percentages of the combined interventions of ALT-PE(M) and engaged time with post checks means. The post checks demonstrate a 44% increase of engaged time and a 88% increase of ALT-PE(M) when compared to baseline. The partial maintenance of ALT-PE(M), engaged time and teacher feedback after intervention phases is a major result of the study. Still, no claim of external validity can be made. Much debate has risen out of several studies (Yerg 1981, Graham, Soares and Harrington 1982, Yerg and Twardy 1982, etc.) that have conflicting conclusions on the importance of teacher verbal feedback on student skill achievement. This study demonstrates that teacher feedback does make a slight difference when attempting to increase student skill achievement. It would seem to make sense that after you increase engaged time while decreasing student waiting during activity that teacher feedback would then help to increase ALT-PE(M).

The second intervention was not as effective as the first intervention, because teachers did not reduce student waiting and did not increase feedback when compared to feedback rates during the first intervention. It would seem that if teachers were given information about student waiting during class they would be able to make changes to reduce it. The more students wait the less they are engaged in p.e. content thus have less of a chance to have an opportunity to practice a skill at an easy difficulty level (ALT-PE(M). It was

evident that teachers did not know how to reduce waiting effectively, so another major conclusion is that many experienced teachers probably need to be retrained in pedagogy through some type of graduate course, teacher workshop or inservice training.

Recommnendations for further study would be to do further research in an attempt to assess the effect of teacher feedback on day to day student achievement. If the teacher behavior of verbal feedback will not dramatically increase ALT-PE(M) what teacher behavior will? This study could be replicated, but with a change in the order of interventions, and no combining of interventions during phase two. Another study suggested is to not only give the teacher the percent of student waiting, but also to help the teacher reduce waiting through instructional supervision during the first intervention. The second intervention should just be giving the teacher the percentage of verbal feedback with no multiple treatment effects. Hopefully with all the research being done some solid results and generalizable facts can be concluded so teacher effectiveness training in physical education will continue!

Table 1
Scored Interval Reliability Percentages for
Six Major Categories During Baseline
Intervention Phases and Percentage Total Intervals

Baseline	Total Categories	Setting	PE Content	Learner Move	Diff	Teacher Behavior	Feedback
Observer 1	80.0	100.0	90.0	73.0	67.0	60.0	93.0
Observer 2	80.0	100.0	91.0	74.0	63.0	78.0	90.0
TOTAL	80.0	100.0	90.5	73.5	65.0	69.0	91.5

Intervention	Total Categories	Setting	PE Content	Learner Move	Diff	Teacher Behavior	Feedback
Observer 1	92.0	100.0	96.0	85.0	65.0	58.0	87.0
Observer 2	81.0	100.0	97.0	70.0	75.0	78.0	86.0
TOTAL	86.5	100.0	96.5	77.5	70.0	64.0	86.5

Table 2
Mean Percentages During Baseline
for Major Coding Categories

Category	Teacher 1	Teacher 2	Teacher 3
PE Content	80.0	83.0	85.0
Engaged Time	45.0	42.5	43.0
ALT-PE(M)	14.5	18.0	16.0
Feedback	14.0	18.0	13.0

Table 3
Mean Percentages During Intervention
Phases for Major Coding Categories

Category	Teacher #1 Intvl #1	Intvl #2	Teacher #2 Intvl #1	Intvl #2	Teacher #3 Intvl. #1	Intvl #2
P.E. Content	89.0	89.5	88.0	89.0	90.0	97.0
Engaged Time	61.0	61.5	61.0	60.5	66.0	79.5
ALT-PE(M)	34.0	35.0	36.0	39.0	27.0	49.0
Feedback	26.0	27.0	25.0	24.5	34.0	35.0

Table 4
Baseline Through Post Check Mean Percentages
for Engaged Time, ALT-PE(M) and Total
Percentages of All Three Subjects Combined

	Baseline	Intv #1	Intv #2	Intv #1 + #2	Increase over Baseline	Post Check
Teacher 1 Eng. Time	45.0	62.0	67.5	64.3	+42%	65.0
Teacher 2 Eng. Time	42.5	61.0	60.5	60.7	+43%	61.0
Teacher 3 Eng. Time	43.0	66.0	79.5	72.7	+70%	60.0
Teacher 1 ALT-PE(M)	14.0	34.0	35.0	34.5	+142%	30.0
Teacher 2 ALT-PE(M)	18.0	36.0	39.0	37.5	+99%	25.0
Teacher 3 ALT-PE(M)	16.0	27.0	49.0	38.0	+138%	27.0

Total	Baseline	Intv #1	Intv #2	Intv #1 + #2	Increase Over Baseline	Post Check	% over Baseline
Engaged Time	43.0	62.6	69.0	65.9	+53%	62.0	+44%
ALT-PE(M)	16.0	32.6	41.0	36.8	+125%	29.6	+88%

Table 5
Baseline and Combined Intervention Phases Average
Amount of Time In Minutes Per Class for
Engaged Time and ALT-PE(M)

	Baseline	Interventions
Engaged Time	12.9	19.8
ALT-PE(M)	4.8	11.1

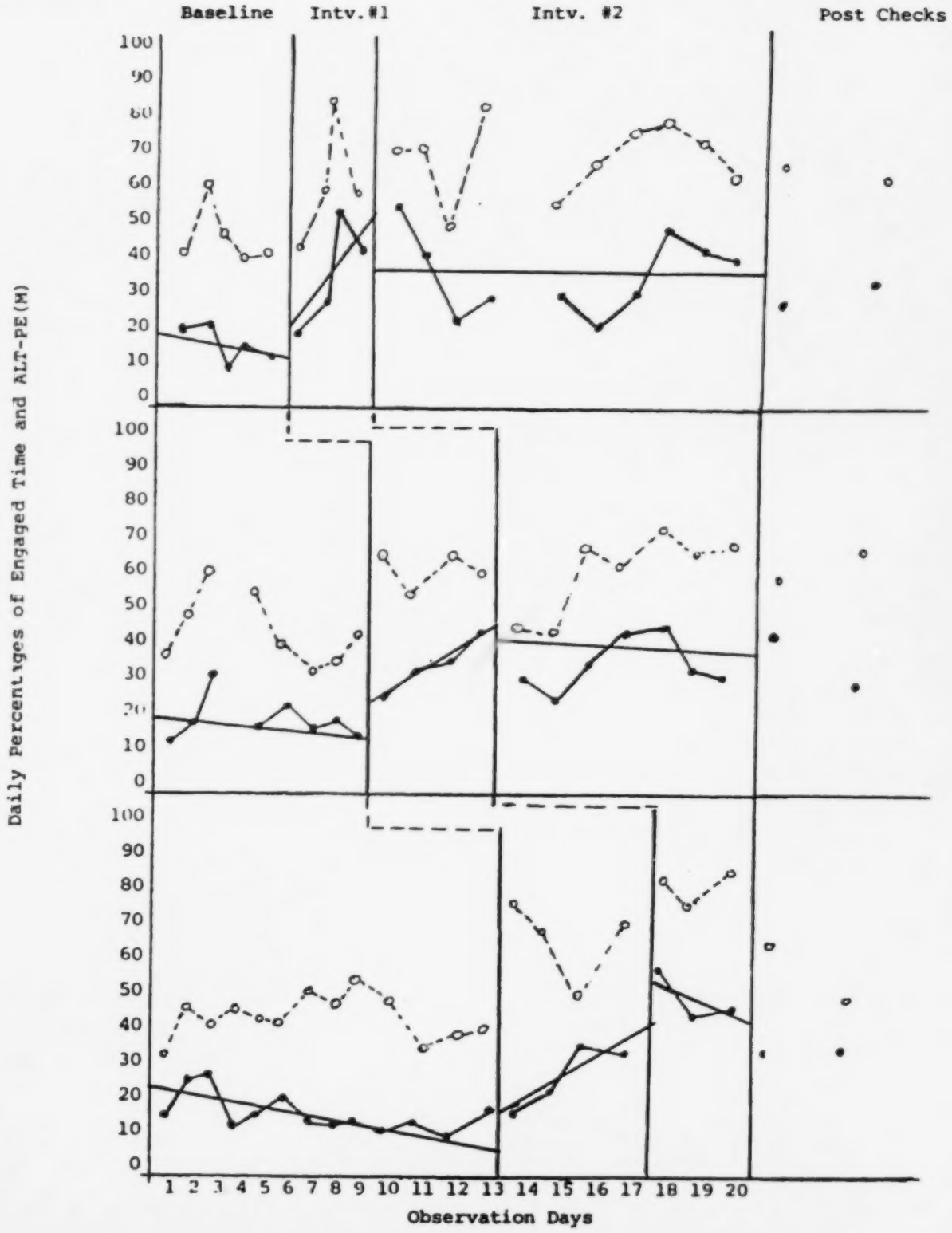

Figure 1 - Percentages of Engaged Time and ALT-PE(M) in the classes of three experienced teachers from baseline, two inventions, and pest check phases. Also line of best fit (trends of the data) through ALT-PE(M) graph.

- - - -Engaged Time ALT-PE(M)

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